A study of the history of traffic noise in a large city: modern Tokyo compared to Edo - the predecessor to Tokyo

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Abstract
With the development of mechanized civilization, transportation of goods and people has become fast and convenient, at the expense of transportation noise which has become a serious problem. This paper aims at comparing the acoustical environment of a modern multi-million city (Tokyo) with the situation one to three centuries ago in the corresponding old city (Edo); also at that time one of the largest cities in the world. Attempts are made to explore traffic noise of Edo through historical records and to compare Edo and Tokyo in this respect. Naturally, as the noise in Edo was not quantified, this study is only qualitative. Edo was a highly developed city in the 17th-19th centuries with a unique system of distribution and ecology and was considered to be an unusually clean city of those times. It is concluded that traffic in Edo was intensive; yet relatively quiet as it was dominated by other modes of transportation than today and with non-motorized vehicles. Yet, sound from people who operated the road vehicles or who carried other people and goods must have been quite loud. At nighttime Edo was closed to traffic and was a quiet city, only interrupted by sound from night watches and fire guardians. Tokyo, on the other hand, is noisy both day and night.

Keywords: Noise, road traffic, history, Tokyo, Edo

1 Introduction
It is widely recognized that noise as a health and environmental problem became serious first during the industrial revolution in the 18th-19th centuries. Transportation noise is considered to have become a major problem when motorized vehicles became common in urban areas. However, the sound from industrialization and motorized vehicles was not only a matter of volume, as people considered the sound of engines and power generation as an unavoidable side effect of a development that provided better possibilities of survival. Therefore the origin
and quality of sound were important. From this viewpoint, it is interesting to study the acoustical environment and how it was perceived in cities before mechanized civilization occurred. As the object of study, the authors selected Edo, the predecessor to Tokyo, since there are many preserved drawings, paintings and other historical records of the Edo city.

Edo was a highly developed city in the 17th to 19th centuries; probably the biggest city in the world at that time. It was located within the present area of central Tokyo but very little is preserved today due to effects of earthquakes, fires, war and development of the modern city. Under strong leadership, infrastructure consisting of roads, rivers and canals were prepared for transportation of large volumes of people and supplies. This paper focuses on traffic noise of Edo; moreover, attempts are made to compare traffic noise of Edo and Tokyo. Through the difference of the quality of sound between the two time periods, the change of human lifestyle and way of thinking we discuss the effects this has had on perceived noise.

2 Tokyo – The modern city

Although not formally, Edo was de facto the capital of Japan since the beginning of the 17th century. In 1868 the Emperor moved from Kyoto to Edo while in the same period major political changes occurred; one being that Japan opened itself to commerce and exchange with overseas countries. The name of the city then changed from Edo to Tokyo and the city has since then been the formal capital of Japan. When considering continuously built-up landmass of urban development containing a high population density, without concern of administrative boundaries, Tokyo is considered to be by far the largest urban area in the world with a population of 34 million [1]. However, administratively, Tokyo Metropolis consists of 23 wards forming central Tokyo, plus 26 surrounding cities, 5 towns and 8 villages, with a population of around 13 million at the present time. Despite multi-storey buildings and roads, see Fig. 1, the urbanized area of Tokyo has expanded dramatically compared to Edo; see Fig. 2. The Emperor's Imperial Palace was built on the place where the previous Edo castle used to be and the monumental "Diet Building", the government office quarters and other major office buildings are located close to the palace. This was also a central part of Edo.

Figure 1 - View of one of the many business districts of Tokyo (left). Expressways in three levels above ground running over a crossing street, very close to the buildings (right).
In central Tokyo, in the 23 wards, there are a large number of commercial areas and business districts, and the price of land is extremely high. Consequently, residential areas spread out from the center of the city (the Imperial Palace and the Ginza area) in a circle. Due to lack of land available for exploitation, high-rise apartment buildings are now built in commercial areas. A network of high-capacity medium-to-high speed roads such as ring roads and expressways have been built, mostly elevated and often in two or three levels, sometimes even in three levels over the ground level. Railroads and subways have created an extremely complex and extensive network for public transportation. Due to lack of space, railroads and elevated expressways often run so close to homes and offices that a traveler might feel that one can stretch out an arm through the window of the bus or train and shake hands with people in the buildings (during traffic jams). Water-borne transportation which previously was important is not practically used nowadays. Altogether, the road and rail infrastructure of the greater Tokyo area may, arguably, be the most advanced, complex and extensive in the world. Even the locals sometimes get confused and lost in this network.

The previously open structure of one- or two-storey homes and shops in Edo has been replaced by closed and airtight apartments and offices in multi-storey houses, many of them in high-rise buildings, which offer reasonable thermal and acoustical insulation.

Figure 2 - Satellite picture (NASA) covering 75x65 km of the greater Tokyo area. Urban areas are in blue and grey, with the Imperial Palace in the center of the picture and city of Yokohama in the lower left-to-center. Tokyo Bay and rivers and waterways connected to it are in dark blue.
3 Edo – The predecessor to Tokyo

Edo is the city that preceded Tokyo in the 17th-19th centuries. Under the reign of the Edo Shogunate it was de facto capital city of Japan for about 250 years. Edo centers geographically around the Edo castle; the mansion of feudal lords (daimyo). Buildings surrounding the castle were the busiest in the city. Further from the center there were the residential areas for townsfolk (chonin). While the area around the mansion was large and many trees planted in the surrounding garden, the townsfolk’s areas were densely packed with wooden buildings with very little vegetation. As a result, there were a number of devastating fires in the townsfolks' areas. The population of Edo was over a million in the mid-18th century\(^1\), surpassing London, Paris, and Beijing in those days. At the end of the 19th century it was 1.3 million, which surpassed for example New York.

Edo is known as an early ecology-friendly city. For example, excrements of humans were used as natural manure and fertilizer in the fields where vegetables were grown, and wood chips and wastepaper were collected and burned as fuel for public baths. Other rubbish was used for reclaiming land from the sea; therefore Edo city was mostly very clean. Moreover the some major waterworks projects were carried out to provide on a large-scale for suitable irrigation, transportation on canals and providing drinking water for people of Edo [2].

Fig. 3 shows a map over the main area of Edo. Note all the waterways which were ideal for transportation. Fig. 4 illustrates the bustling day life in Edo.

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\(^1\) This figure which comes from the Tokyo Metropolitan government website is arguable, as some other sources claim it was approx 600 000.
(musical instrument, like a guitar), plays at the theater, and merchants drawing attention to their sales by various oral expressions. These amusements were enjoyed by the townsfolk.

Edo was under the reign of the so-called Shogunate; residing in the Edo Castle. There were many mansions owned by the daimyo (feudal lords) who were under the direct control of the Shogunate, while townsfolk lived in row houses. Fig. 5 illustrates the very dense housing, the type of buildings, and how people lived and worked in rows of one- or two-storey houses.

![Figure 5 – Painting of Edo (photo of painting in exhibition in the Edo Museum).](image)

4 Traffic sounds of Edo

A large variety and volume of supplies were needed for the city, which had to be transported into Edo. Most supplies were transported by boat because Edo was located by the sea (the sheltered Tokyo Bay) with many rivers supplemented by canals (see Fig. 5), and warehouses stood in a row along the riverbank. Consequently, waterborne traffic was the dominating mode of transport. The boats were sailed, rowed or paddled, which means that the sound of this type of transportation was not disturbing.

Land transportation was mainly used for people or supplies when there was no nearby waterway or for local transportation; for example letters and articles were sent to the Shogunate transported by horse. People in general walked on foot, the samurai could ride a horse and people of high rank could be carried in a palanquin; see Fig. 6. Wheeled vehicles were not used for transporting people until late when man-pulled rickshaws become popular.

![Figure 6 – Modes of transport for people in Edo-Yotsuya Okido (picture from Edo Meisho Zue; an illustrated guide describing famous Edo places) [3].](image)
All kinds of supplies were carried on foot on porters’ shoulders or loaded onto horses in the early history of Edo. However, around 1680-1709 (called the Genroku era), society was stable and there was a rise in the standard of living of townsfolk which required more supplies for consumption. More efficient ways of goods transportation were then needed; therefore, simple wheeled vehicles were used. Light two-wheeled daihachi-guruma carts were pulled and pushed by men and the heavier wooden ushi-guruma were towed by cattle; see Fig. 7.

![Figure 7 – Example of a cart, ushi-guruma, pulled by cattle and used for goods transportation. This cart was used for an important traditional procession (photo shot in the Edo museum).](image)

Both daihachi-guruma and ushi-guruma were made of wood and it is likely that they made some noise, such as creaking and noise from the wooden wheels rolling on gravel. Probably the cattle were driven by shouts and whiplash by the operator.

Horses did not tow wheeled vehicles in Edo, but they were frequently used to carry goods, as one can see in paintings. Often straw sandals were put on the hooves for protection; see Fig. 8, something which must have reduced the clatter of hooves on the gravel and bridges; although the noise concern was not a major one. Since there was heavy penalty against causing traffic accidents in Edo city, it was next to impossible to let horses run which, together with the circumstances mentioned above, should have meant that the sound of the horses was not a noise problem; unlike the case in western countries.

![Figure 8 – Sandals on the hooves of the horses (picture from One Hundred Famous Views of Edo, by Hiroshige) [4].](image)

Most pedestrians in Edo wore leather-soled sandals or straw sandals made from soft materials, and it is reasonable to assume that the sound of walking was of no concern even though the number of pedestrians was very large. However, later in the Edo period people started to wear wooden clogs (geta), the clapping of which must have caused appreciable sound. Maybe this was a habit brought to Japan by the Dutch merchants which were the only ones from abroad admitted access to Japan in this time period.

What kind of surface did the streets of Edo have? It seems that the streets of Edo were dusty or muddy, depending on season and weather, and then people tried to pave them with packed gravel or something similar. On the major highways to Edo city the ground was
paved with gravel and kept flat, and there were gutters along them, as required by the Shogunate. It is probable that the streets of Edo were of similar construction as the highways. As far as consistently shown in paintings or prints from those times, the streets of Edo city appeared to be flat and in good condition. A reason for this was that transport on wheels was relatively insignificant and thus did not create the poor roads as in Europe. Therefore, the sound of footsteps by people, horses or cattle was probably not generally annoying to people, despite the high volume of pedestrians and animals. However, there were some block pavements with stones, primarily in the precincts of a shrine or near a big gate of the city. On these pavements, sound from the wheels must have been significant; probably also from the hooves of cattle and "naked" horse shoes. Due to the extensive waterborne transportation network, many bridges made of wood or stone were built across rivers and canals. It appears in paintings and prints that people wore wooden clogs crossing wooden bridges. This, together with daihachi-guruma and ushi-guruma should have caused hard impact sounds of substantial level, maybe amplified by resonances in the wooden structures. Fig. 9 shows the typical bridge construction and Fig. 10 illustrates the bridge traffic.

Means of land transportation were walking, horses that wore straw sandals carrying loads or riders, and wheeled carts towed by cattle or pulled by men. The loudest sound probably came from the wheeled vehicles; especially on the many bridges and the few stone
pavements. Considering the intensive traffic and the heavy loads of the carts, land transportation must have caused some noise concern for people in those days.

As far as the volume of traffic was concerned, it was reported that the total number of daihachi-guruma (wheeled vehicles) amounted to 2000 in 1727. Since the width of streets was narrow and Edo was not large compared with modern Tokyo, the number of wheeled vehicles was a relatively large quantity; enough to cause the Shogunate to issue the official notice "no parking on narrow streets, when many carts run continuously in the city they must run at regular intervals". It did not say anything about sound or noise from them; however, it showed that many wheeled vehicles travelled the streets and that this was regarded to be a problem in Edo. Judging from this, it is assumed that the wooden vehicles caused loud and frequent sounds which might have had some impact.

Sankin-kotai is a system under which feudal lords in the Edo period were required to spend every second year in their residence in Edo. When they arrived to Edo they walked in a feudal lord's procession that was made up of 50 to 4000 people. Thus, a lot of people travelled in and out of as well as within Edo and when the population reached one million, and even 1.3 million at the end of the Edo era, it is not difficult to imagine that there was significant sound of pedestrians, horses and cattle; and not the least from the voices of people.

The discussion above refers to daytime activities. There were in Edo a lot of castle gates and town gates called kido. The town gates were open during daytime and early evenings but closed during nighttime: the open time was between about 6 and 22. Night time in Edo it was very dark, few people walked on the streets and of course vehicles did not run. Therefore, Edo was quiet in nighttime, sleep should have been undisturbed, and the problem of traffic noise did not exist.

5 Traffic sounds in the present Tokyo

Like many other large cities, Tokyo has huge noise problems. As in Edo, in modern Tokyo, a large number of people, shops, businesses and supplies are concentrated in a relatively small area. The most notable differences between Tokyo and Edo are the modes of transportation, including the vehicles used, and the expansion from a "two-dimensional" city to a "three-dimensional" one. While Edo was a city vertically contained within about 10 m as the buildings mostly had two floors, of which the lower one was where people in general lived [6], large parts of modern Tokyo consists of multi-storey buildings and the road system is largely built in more than one level (Fig. 11) and the rail system is partly underground. The highly-developed network of waterborne transportation in Edo was very convenient to transport large quantity of goods and people, but in Tokyo road and rail transport has taken the place of it. The main means of transportation in and around Tokyo are car, bus, truck, and trains. Although the road traffic network is continuously improved network capacity and traffic are monitored and optimized by a very advanced ITS system, traffic is increasing and traffic jams are unavoidable in a number of places along roads and expressways. The elevated expressways create new challenges for noise reduction as the noise emission from these more easily propagates longer distances and the lack of land for development means that roads and railways run extremely close to buildings (Fig. 12), which even further accelerates the problem. To counteract the noise problem, Japanese vehicles meet stringent noise emission requirements, noise barriers have been built at an unparalleled extent and the road and street surfaces have been widely exchanged to low-noise types. Nevertheless, the increased traffic volume has prevented the aim of controlling the noise increase to be achieved.
There are still houses made of wood in Tokyo, but these are much better soundproofed than in the Edo era, and buildings made of concrete and steel have taken over overwhelmingly. There are sometimes also buffer buildings along the highways protecting more sensitive buildings both from noise and the spread of fires.

Figure 11 – Typical multilevel Tokyo expressways.

Considering the circumstances mentioned above, there are Environmental Quality Standards (EQS) which deal with traffic noise in Tokyo, as well as in other parts of Japan. Since 1999 these requirements, applicable to road traffic noise, are as shown in Tables 1-2.

Table 1 - Environmental Quality standards in Japan for road traffic noise; general areas [7].

<table>
<thead>
<tr>
<th>Type of area</th>
<th>Daytime</th>
<th>Nighttime</th>
</tr>
</thead>
<tbody>
<tr>
<td>AA</td>
<td>50 dB or less</td>
<td>40 dB or less</td>
</tr>
<tr>
<td>A and B</td>
<td>55 dB or less</td>
<td>45 dB or less</td>
</tr>
<tr>
<td>C</td>
<td>60 dB or less</td>
<td>50 dB or less</td>
</tr>
</tbody>
</table>

Notes:
1) In terms of the time category, daytime shall be the period from 6:00 a.m. to 10:00 p.m. and nighttime shall be the period from 10:00 p.m. to 6:00 a.m. of the following day.
2) Area category AA shall be applied to areas where quietness is specially required, such as those where convalescent facilities and welfare institutions are concentrated.
3) Area category A shall be applied to areas used exclusively for residences.
4) Area category B shall be applied to areas used mainly for residences.
5) Area category C shall be applied to areas used for commerce and industry as well as for a significant number of residences.

Table 2 - Environmental Quality standards in Japan, for "areas facing roads" [7].

<table>
<thead>
<tr>
<th>Area category</th>
<th>Daytime</th>
<th>Nighttime</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area A facing roads with two or more lanes</td>
<td>60 dB or less</td>
<td>55 dB or less</td>
</tr>
<tr>
<td>Area B facing roads with two or more lanes, and area C facing a road with one or more lanes</td>
<td>65 dB or less</td>
<td>60 dB or less</td>
</tr>
<tr>
<td>Space adjacent to a road carrying arterial traffic</td>
<td>70 dB or less</td>
<td>65 dB or less</td>
</tr>
</tbody>
</table>

Notes:
For areas facing roads, this table will be valid instead of Table 1. If the road carries arterial traffic, the last row in this table applies. Standards for indoor noise transmitted from the outside (45 dB or less for daytime, and 40 dB or less for nighttime) can be applied for the respective residences whose windows are judged as usually closed on the sides most affected by noise.
According to the Tokyo Metropolitan Government (TMG), “Regarding traffic noise, achievement of the Environmental Quality Standard is still low”. The latest reported achievement of the Environmental Quality Standard was as follows: “According to a survey on road traffic noise conducted in fiscal year 2006, out of 616 sections along the roadside (within a range of 50m from the road boundary) of trunk roads, the achievement rate of the environmental quality standards was 88 percent and 77 percent in the daytime and nighttime, respectively. However, in areas closer to the roads (where special exception standards apply for measurement within a certain distance from a trunk road) the achievement rate of environmental quality standards was lower, at 80 percent and 65 percent in the daytime and nighttime, respectively” [8].

It further reads "In order to reduce road traffic noise, it is necessary to comprehensively promote various measures, including noise reduction generated by vehicles, low-noise pavement works, and traffic volume reduction. TMG is endeavoring to reduce road traffic noise in collaboration with concerned organizations, including the selection of prioritized road sections where such measures are to be promoted" [8].

With regard to railway noise, many houses have been built close to railway tracks and stations (Fig. 13). The standard for railway noise merely applies to the Shinkansen trains. Despite this, there are few complaints about railway noise, perhaps because it may have been recognized as something existing for a long time and "unavoidable".

Aircraft sound is not a serious problem in Tokyo, since the international airport Haneda is now located off-shore. However, there are many complaints about air traffic noise for the
area around the Yokota air base and the area nearby the Atsugi air base; since these areas do not comply with the standard. Helicopters make noise that people complain about in central Tokyo. With regard to measures against this, TMG says as follows: “For helicopter noise, advanced regulations are thoroughly introduced” [8].

Aircraft and trains do not run in the middle of the night, but road vehicles run 24 hours. This fact probably reduces complaints for air and rail traffic. It is also believed that the existence of the environmental quality standards, the progress of engineering, the change of life style, and the perception that sounds of traffic are things unavoidable in a large city have contributed to a certain acceptance for traffic noise in Tokyo.

6 Comparing Edo and Tokyo from an acoustical viewpoint

6.1 Immission of sound into homes

In Edo, townspeople lived in row houses; mostly with a shop, workshop or other business fronting the street and with living quarters placed behind. The feudal lords' mansions were large and had a large garden around it. Most houses were of an open type with large openings and temporary inner walls of thick rice paper which provided little obstruction to noise. Thus, the sound from the street should have reached people in the shops, workshops and other businesses almost without any reduction, while in the residential part behind it sound would to some extent be reduced by screening and propagation. It was reported that the noise in these living quarters behind were much lower than at the street [6]. The feudal lords would have a quiet mansion all the time.

In Tokyo, people live either in wooden houses on ground level and one or two floors up, or in apartment houses with several floors. These would all have glass windows of at least single type, providing insulation against sound and warm or cold ambient air. Modern apartments might have more advanced windows providing good sound (as well as thermal) insulation. Sometimes buffer buildings would provide extra sound reduction in the homes. Therefore, in Tokyo as opposed to Edo there would by superior sound reduction through building design, also providing superior thermal comfort. On the other hand, the simpler types of air conditioning devices might cause some noise nuisance. Compared to the relatively open Edo houses, in modern Tokyo most buildings would offer 15-25 dB more noise reduction to the residents than in ancient times. But the emission of sound has increased by far more than that.

6.2 Day and night sound patterns

In daytime, Edo was a very busy city and Tokyo is very busy too. Tokyo is still a noisy city at nighttime; in some areas due to night life, and in the entire area due to traffic. Traffic volume is significantly lower at nighttime but, on the other hand, traffic can run faster without jams.

In contrast, at night, Edo was in deep darkness and the city gates were closed. People could pass through the gates in case of necessity, while wheeled vehicles could not pass. The nights were, therefore, very quiet. It was reported that the quietness was interrupted by two night watchmen going on their beat (rounds) starting just after sunset [6] and continuing through the night. One of them, usually one man per street, used wooden clappers to inform about the time, repeating this sound at almost each house. The second night watch was the fire guardian who dragged bamboo sticks or iron rods on the street. An iron ring on top of the stick or rod then created a very annoying sound. These sounds should have indicated to
people that they were safe. It was not reported what sound was used to warn about an actual fire. Edo was often struck by fires despite having an advanced fire fighting system.

Consequently, while Tokyo is noisy even at night, Edo was a very quiet city during nights.

6.3 Sound of wheeled vehicles

In Edo, wheeled vehicles provided a relatively small part of the transportation work, although they were in no way negligible. The wheels were made of wood and in general seemed to have no material to provide less wear (as steel used around wheels in Europe) or smoother rolling. However, it was indeed reported in [6] that there were quite extensively used 2- and 3-wheel vehicles at the end of the 18th century having a softer material (twinned rope or similar) around the circumference of the wooden wheels to reduce wear of the wood, but they were said to exist only in and around Kyoto city (then known as Miako in western countries) [6]. These were reported to create substantial wear on the roads. It is not known to the authors if this type of vehicle might have spread to other parts of Japan in the next century.

According to an official notice from the Shogunate, there was a heavy penalty for causing a traffic accident. Therefore, vehicle users were careful in operating wheeled vehicles and did not run fast with their daihachi-guruma, and ushi-guruma were naturally slow as they were pulled by cattle. Speed was, therefore, nothing that caused increased traffic noise in Edo.

Nevertheless, in Edo it is reasonable to believe that the wooden wheels made a creaky mechanical sound, maybe even jarring, that was very different from the other sounds on the streets. However, the authors have so far been unable to find a description about traffic noise in any of the available research materials. This would suggest that traffic noise from neither wheeled vehicles nor horses or people carrying goods was of any significant concern.

The noise of road vehicles in Tokyo, tyre/road noise, is of course a major problem, and is estimated to be responsible for the dominating part of traffic noise from expressways and on most streets where traffic runs fairly uninterrupted. The Tokyo noise map also contains noise from the power units of the vehicles, which is of course another major difference to Edo.

Apart from this, the biggest difference between Tokyo and Edo is probably the continuity of the noise. Road vehicles run through Tokyo the entire night while in Edo there was no traffic allowed at all at night time; thereby creating a totally calm period when it was most needed. The modern life style has become diversified with regard to time in Tokyo, while on the other hand life in Edo was more regular and predictable over the 24 hours.

Secondly, it is more difficult to accept sound which people consider as not being related to them. As far as drawings and prints from the Edo era show, the contents of the loads carried by daihachi-guruma and ushi-guruma, as well as by horses and men, was recognizable for people, and it was mostly practical things needed for their daily life. This should have created wide acceptance to any sound that was caused by such transportation. On the other hand, in Tokyo it is difficult to recognize all contents of loads on and in vehicles, and it is not automatically linked to any urgent or obvious need to people. Thus, transportation sounds in Tokyo should be less acceptable to people, even if sound levels would be similar.

Thirdly, although the sound levels of daihachi-guruma and ushi-guruma would on normal streets be quite non-objectionable, one can imagine that it could turn into a nuisance when the wooden wheels rolled over the many wooden bridges.
Under the circumstances mentioned above, it is estimated that the sound of wheeled vehicles should have been of little or no nuisance in Edo.

6.4 The use of voices

Was Edo actually a very quiet city compared to Tokyo? As mentioned above, Edo was extremely quiet in nighttime, but a lively and bustling city in daytime. As written above, wheeled vehicles were probably rather quiet, except on bridges and a few stone pavements, and there were no combustion engines or similar that caused noise. But the vehicles and the road transportation largely relied on human engines and these "road labourers" are known to have shouted much of the time to keep up the pace and synchronize their work [9]; especially when a few labourers operated daihachi-guruma simultaneously. Palanquin bearers and large oblong chest bearers also did the same thing. Not even ushi-guruma pulled by cattle should have been noise-less as the people operating them probably shouted at the cattle to push them on. Even water transport, when rowing was necessary, should have depended on some voice(s) to synchronize the rowing crew. In other words, vehicles, boats and other human-based transport passed through the streets and waterways of Edo with substantial sound produced, namely made by human voices. Although this might not have reached 75 dB (L_{Aeq}) at the roadside, as modern traffic does, it should have created a sound environment which was far from quiet and with a totally different sound compared to modern Tokyo.

The voice of pedlars and street vendors echoed throughout Edo from early morning until late evening. People could not store foods, but pedlars carried fresh vegetables, fish and daily necessities to them. Pedlars brought a great variety of goods to the townsfolk; candy, dumpling, gelidium jelly, ground mixture of red pepper and aromatic spices, fruit, broom, bamboo colander, toys, flint, and buckwheat noodles. Each pedlar had a certain shout or other sound that identified him or her in the general din. Furthermore, pedlars sold goldfish for watching and amusement, and chirping insects for listening and amusement. Listening to the sound of insects was enjoyable and popular in Edo; something enjoyed also by present Japanese.

Also in modern Tokyo, in some areas, there are pedlars. Pedlars selling baked sweet potatoes were common in Tokyo until quite recently (some may still be active); one could hear their shouts through loudspeakers. Lots of loudspeakers have been installed in busy streets and the sound of commercial messages is common in downtown Tokyo. Thus, people of Edo and also of Tokyo use(d) voices and other sounds for commercial reasons. It is difficult to say which might be the most disturbing, Edo or Tokyo, since such sounds are perceived differently for each individual and at different times.

6.5 Useful or pleasant sounds

Popular music in Edo was played on samisen; a 3-stringed musical instrument played with a plectrum. Chirps of insects, such as crickets, and of samisen, were part of daily life of Edo. With the exception of insects, and pop music instead of samisen, this is part of life also in Tokyo. Since time in Edo was flexible according to the length of daylight, a bell informed about time instead of a clock. The 11 bells installed in Edo rang three times for calling people's attention at first; after that, rang a number of times.

The Tokyo sound environment includes many commercial and notifying announcements: in trains and at platforms, "watch your steps" when using an escalator, go/don't go sounds at pedestrian crossings, warning sounds of reversing trucks, etc. It seems that sound was/is used as an important tool for people's life both in Edo and in Tokyo.
7 Conclusions

Traffic in Edo was largely based on waterways; a relatively quiet way of transportation. Road transportation was also important but included a rather limited number of wheeled vehicles, most of which were pulled by humans. Humans also carried other humans as well as goods. While the vehicles were rather quiet, the people pulling, pushing or carrying them were far from quiet; they used their voices to synchronize the work and to keep-up the pace. Pedlars were also responsible of substantial sound in Edo. Houses, which were mainly row houses in two storeys, were not very efficient sound insulators but the living quarters were somewhat protected behind shops and workshops. At nighttime, Edo was essentially closed and very quiet, with the sound of night watches and fire guardians breaking the quietness.

In contrast to this, Tokyo is much larger than Edo, but not only in terms of area but more so in the vertical direction, as it contains multi-storey buildings, high-rise buildings and multi-level expressways. This modern “megacity” is noisy both day and night; there is never a quiet period, mainly due to motorized road transport. However, buildings provide much more effective sound insulation. Despite this the environmental quality standards are far from being complied with. Noise problems are much worse than in Edo; although Edo in daytime also was a busy, bustling and noisy city.

Apart from the extent and modes of transportation, an important difference is that in modern Tokyo there are possibilities to apply technical noise abatement measures, while in the Edo era there were practically no known technical noise-reducing options.

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References